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(54) IMPROVEMENTS RELATING TO SMOKING ARTICLES

(71) We, BRITISH-AMERICAN TOBACCO LIMITED, a Company incorporated under the laws of Great Britain, of Westminster House, 7, Millbank, London, S.W.1., do hereby declare the invention, for which we

10 This invention is concerned with improvements relating to smoking articles, particularly cigarettes, cigars and the like, including filters therefor, and especially with means for influencing the nature of the tobacco smoke and/or the burn characteristics of the articles and/or the physical properties of the tobacco rod comprised therein.

20 It is known that the nature of tobacco smoke can be altered by additions of modifying substances to a filter or to the tobacco or a wrapper. The additive may be introduced in the form of a solid or liquid. Capsules or microcapsules have also been used. The introduction of additives may require complicated and bulky apparatus and accurate dosing. Required distribution of the additive in a filter rod or tobacco rod is difficult to obtain.

30 It is an object of the invention to provide a simple and accurate method and means of supplying an additive to a rod component of a smoking article. A further object is to provide a simple method and means for supplying an additive to a wrapped rod component, especially tobacco rod, and at the same time providing holes for ventilation. In the case of filter rod, it is an additional object to assist in the avoidance of difficulties which arise in the known production of dual and multiple filters assembled from separate rod sections of which one at least contains an additive.

40 According to the invention, in producing a rod component for a tobacco-smoking article, more particularly for a cigarette, an

additive is introduced into a rod of the material of the component at intervals along the length of the rod by needleless injection into the said rod through its peripheral surface. The technique of needleless injection is well known for the purpose of medical inoculation. Additives may be thus introduced into a rod of smoke-filter material or into a rod of natural or reconstituted tobacco or tobacco substitute.

50 According to one manner of carrying the invention into effect, the additive, in the form of a solution or dispersion, is fed to a pump whose outlet is connected to an injection nozzle. If more than one additive is to be injected, more than one pump and nozzle will be provided, but the pumps may be grouped as a single unit and a single nozzle holder may be used, the nozzles being spaced at a predetermined distance apart. The nozzle or nozzles are located close to or substantially in contact with the surface of the rod to be injected. A measured volume of liquid is supplied to the nozzle or each nozzle and is subjected to a sudden thrust by the pump piston, whereby it is ejected from the nozzle with such force that it penetrates into and impregnates part of the rod. The size of hole formed will depend on the diameter of the nozzle, the pressure on the liquid and the distance of the nozzle from the rod surface. The number of holes will depend on the number of nozzles used. The rod and/or nozzle or nozzles may be stationary or moving.

80 In the case of the production of filters, a rod of a permeable smoke-filtering material, for example fibrous or foam material such as cellulose acetate or an open-cell thermoplastic foam material, such as polyethylene or polypropylene, is impregnated with a predetermined quantity of a solution or dispersion of an additive by needleless injection of the rod at intervals, generally regular intervals, along its length. More than one

type of additive may be so injected into what will be different sections of the eventual filters. The nozzle or nozzles may be so located on or in relation to a machine which produces the rod of permeable material, that the injection occurs either immediately before wrapping of the rod or immediately following extrusion from a rod-extruding die of the said machine. The treated rod is finally cut into sections, the cutting being synchronised with the injection and the movement of the rod, so that dual or multiple filters, or the equivalent of such filters are produced. These are ready to be assembled with cigarettes on a conventional filter-tip cigarette-making machine.

Suitably, 25 to 150 mg of additive may be thus introduced per treated section of filter.

A suitable extruded foam material is one produced by Messrs. Monsanto Chemical Ltd, as described in their United Kingdom Patent No. 1,182,646. This material can be extruded in filter-rod form.

The foam material may be such as has a relatively smoke-impervious surface layer, as may be the case with the material last mentioned. The rod need not then be wrapped before it passes through the injection apparatus.

As far as the injection is concerned, similar procedure may be adopted in the case of wrapped tobacco rod. In this case, the nozzle, or nozzles may be located between the garniture and cut-off means of a conventional cigarette-making machine. The location of the nozzle or nozzles and/or the timing of the injection or injections will then determine the position of the hole or holes in the wrapper and of the injected region or regions in the cigarettes produced. A small permanent hole may or may not be formed in the wrapper at the injection point. If a permanent hole is formed, it may serve for ventilation or smoke-dilution purposes in per se known manner.

Substances which may be added to filter rod in the above-described manner are solutions or dispersions of organic or inorganic, acidic or alkaline, materials, or slurries, for instance of carbon or alumina, of finely divided metals such as zinc or of small beads of ion-exchange material. They may be substances with specific or selective smoke filtration properties or substances which promote filtration. Specific substances which may be used include manganese dioxide, zinc oxide or acetate, polyethylene imines, lithium chloride, sodium carbonate, trisodium phosphate, ethylenediamine diacetate and zeolites. In addition to additives concerned with filtration, additives concerned with smoke-flavour improvement or modification, such for example as menthol, sweetening agents and the like, or com-

binations of such, may be similarly introduced. In all cases, naturally, the substance should not be such as to interfere deleteriously with the substance of the rod.

Substances which may be added to tobacco rod include solutions of organic or inorganic, acidic or alkaline, materials or may be in the form of slurries, for instance of carbon, chalk or zinc oxide. Such substances may be humectants, tobacco extracts or casings, such as cane sugar, invert sugar, liquorice, cocoa, maple syrup, citric acid and tartaric acid, and the like. Additives concerned more particularly with smoke-flavour improvement or modification include, for example, menthol, sweetening agents and the like. Combinations of any of the above substances may be similarly introduced, either together through one injector or separately at spaced intervals through separate injectors.

If required, an additive or additives may be injected into a filter-rod section or sections as well as an additive or additives injected into a tobacco section of a cigarette, for example.

One manner in which the invention can be carried into effect will now be more fully described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic representation of injection apparatus,

Figure 2 an elevational view of an injector, and

Figure 3 a section on the line III-III in Figure 2.

For the injection of a single additive, the apparatus consists of a single-unit injection pump 1 having sliding-rack control of the volume delivered per stroke and operated by a camshaft 2. This unit may be of a well known type used for fuel injection in internal combustion engines. The speed of the shaft 2 is controllable by a variable-speed gear 3 in its drive. The pump 1 is gravity fed from a reservoir 4 holding the additive in solution. The outlet 5 of the pump is connected to a nozzle holder 6 (Figure 3), again of a type well known for fuel injection, into which a range of calibrated nozzles can be fitted, enabling the delivery pressure to be varied. The nozzle 7 may comprise an orifice 8 with a small, centrally mounted, pintle of flaring conical form for dispersing the jet of additive. The diameter of the orifice may vary from 0.25 to 1.5 mm, depending on the size and cone angle of the pintle. The nozzle holder 6 is attached to a fixedly mounted rod-guiding body 9 through a bore 10 in which the rod 11 to be injected passes. A supporting plunger 12 loaded by a spring 13 is accommodated in a cap 14 attached to the back of the body 9 and projects into a transverse

bore 15 in the latter. By a semi-cylindrical recess 16, the plunger 12 holds the rod against the nozzle holder 6 to absorb the impact of injection and to minimise fluid 'splashing'. The loading can be adjusted by a screw 13'. The rod 11, coming from a rod-forming machine, is pulled through the holder by a known caterpillar haul-off device (not shown). The injection is synchronised with the haul-off means and with cut-off means associated with the rod-forming machine. The nozzle orifice 8 is extended to the peripheral surface of the rod 11 by a bore 17, the distance between the nozzle and rod depending on the nature of the rod being injected. It will generally be between 0 and 7 mm. The pressure at which the additive is injected also depends on the nature of rod and may be between 5 and 300 kg/cm², but is preferably between 120 and 220 kg/cm².

If it is desired to inject a rod with different additives in different sections, particularly a filter rod from which filters with different additives in different sections are to be produced, the above-described apparatus may be duplicated, as indicated by the same numerals in Figure 1, but with the suffix *a*. However, the pumps 1 and 1*a* may be pumps of a dual pump unit, as shown, and the nozzles 7 and 7*a* and their associated components may be mounted in a common holder.

Examples of the application of the invention, using the above-described apparatus are as follows:

Example 1

A wrapped tobacco rod produced at the speed required for 1,000 cigarettes per minute was injected every 69 mm, i.e. once per cigarette length, with 12.5 microliter of a 20% solution of menthol in triacetin, using an injection pressure of 150 kg/cm² and a distance of nozzle from rod of 0.5 mm, the diameter of the nozzle orifice being 0.75 mm. Cigarettes produced from this rod each contained 3 mg of menthol.

Example 2

A wrapped tobacco rod was injected as in Example 1, using the same additive, but the nozzle-orifice diameter was 0.25 mm, the pressure 150 kg/cm² and the distance of nozzle from rod 1 mm. Cigarettes produced from the rod had, in addition to the content of menthol, a hole in the wrapper of about 0.25 mm diameter for ventilation.

Example 3

A wrapped filter rod of polyethylene foam material produced at a rate equivalent to 300 rod lengths, each 90 mm long, per minute was injected with 50 microliter of a 10% aqueous solution of polyethylene imine

at a rate of 30 shots per second using a pressure of 210 kg/cm², a distance of nozzle from rod of 0.5 mm and a nozzle-orifice diameter of 0.75 mm. The rod was cut to the 90 mm lengths and finally to dual-filter lengths of 15 mm, each comprising a section containing 5 mg of polyethylene imine.

Example 4

A filter rod of cellulose acetate produced at a rate equivalent to 300 rod lengths, each 80 mm long, per minute was injected at a rate of 20 shots per second with 50 microliter of a 10% aqueous solution of sodium carbonate and with 50 microliter of a 10% aqueous solution of polyethylene imine using two, spaced, nozzles (as at 7, 7*a* in Figure 1). The distance of the nozzles from the rod was 0.5 mm and the pressures used were 210 kg/cm². The diameter of the nozzle orifices was 0.75 mm. The filter rod was finally cut into triple filter lengths, each 20 mm long, composed of a 7 mm section containing 5 mg of sodium carbonate, a 6 mm section containing 5 mg of polyethylene imine and a 7 mm section of untreated cellulose acetate.

WHAT WE CLAIM IS:—

1. A method of producing a rod component for a tobacco-smoking article, wherein an additive is introduced into a rod of the material of the component at intervals along the length of the rod by needleless injection into the rod through its peripheral surface.
2. A method according to claim 1, wherein the said component is a rod of tobacco-smoke filtering material.
3. A method according to claim 2, wherein the rod is composed of an open-cell foam material.
4. A method according to claim 2 or 3, wherein the rod is composed of an extruded thermoplastic material.
5. A method according to any one of claims 2 to 4, wherein the injection is effected immediately after formation of the rod by a rod-forming machine.
6. A method according to claim 1, wherein the said component is a rod of tobacco.
7. A method according to claim 6, wherein the injection is performed during passage of the tobacco rod through a cigarette-making machine.
8. A method according to any one of claims 1 to 7, wherein the injection is performed within a rod-guiding device in which the rod is supported, oppositely to an injection nozzle, by a resiliently loaded member.
9. A method according to any one of claims 1 to 8, wherein the rod component is injected with two or more additives at separated points along the rod.
10. A method of producing a rod com-

ponent for a tobacco-smoking article substantially as hereinbefore described with reference to the accompanying drawings.

11. A method of producing a rod component for a tobacco-smoking article substantially as hereinbefore described in any of Examples 1 to 4.

12. Apparatus for carrying out the method according to any one of claims 1 to 11, comprising needleless injection means including at least one injection nozzle directed for injecting the additive into the rod component through its peripheral surface and a guide for the rod component at the injection point or points.

13. Apparatus for carrying out the method according to any one of claims 1

to 11 substantially as hereinbefore described with reference to the accompanying drawings.

14. A tobacco-smoke filter produced with the assistance of the method, or apparatus, claimed in any one of claims 1 to 5 and 8 to 13.

15. A smoking article having a tobacco-rod section produced with the assistance of the method, or apparatus, claimed in any one of claims 1 and 6 to 13.

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1342931 COMPLETE SPECIFICATION
1 SHEET. This drawing is a reproduction of the Original on a reduced scale

